

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: 9/1/70

Project Title: **X-Ray Determination of the Degree of Polarization
of Ceramic Transducers**
Project No.: **A-1284**
Project Director: **C. E. Wagner**
Sponsor: **U. S. Army, Frankford Arsenal**
Effective **August 17, 1970** Estimated to run until: **October 31, 1970**
Type Agreement: **Purchase Order No. DAAA-25-71-M0372** Amount: \$ **500.00**

Reports: Letter Report and Photographs due 10/31/70.

Contact Person: **Miss C. Young**
U. S. Army, Frankford Arsenal
Tacony & Bridge Streets
Philadelphia, Pa. 19137

Phone: **(AC 215) JE5-2900**
Extension 28212

Assigned to **Physical Sciences** Division

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GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT TERMINATION

Date 3/10/71

PROJECT TITLE: X-Ray Determination of the Degree of
Polarization of Ceramic Transducers

PROJECT NO: A-1284

PROJECT DIRECTOR: C. E. Wagner

SPONSOR: U. S. Army, Frankford Arsenal

TERMINATION EFFECTIVE: March 8, 1971

CHARGES SHOULD CLEAR ACCOUNTING BY:

NOTE: No work was done or funds expended
on this project. Frankford Arsenal
failed to forward the samples that
were to be analyzed.

Physical Sciences Division

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GEORGIA INSTITUTE OF TECHNOLOGY

Physical Sciences Division

October 7, 1971

225 North Avenue N. W.
Atlanta, Georgia 30332
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U.S. Army, Frankford Arsenal
Tacony & Bridge Streets
Philadelphia, Pennsylvania 19137

Attention: Miss C. Young

Subject: Letter Report, Project A-1284
"X-Ray Determination of the Degree of Polarization of Ceramic
Transducers"



Gentlemen:

A preliminary investigation of the ceramic transducer samples from Automation Industries, Inc. and Branson Instruments, Inc. was made by x-ray diffraction techniques to determine if there was any observable parameter which was indicative of the degree of polarization of the samples. The results obtained do not indicate the existence of such a parameter which would be a useful indicator.

The samples from Automation Industries were a PZT-4 and a PZT-5 disk, 3/4" in diameter. From Branson we received six 3/8" diameter disks (assumed to be lead-metaniobate from their diffraction patterns), three of low polarization and three of high polarization.

Two-theta scans were made on a standard powder diffractometer for two orientations of the PZT disks, differing by a 90° rotation about the disk normal. Both high and low polarization disks from Branson were likewise run. Scans from 15° to 130° two-theta were made. In no cases were variations in peak heights, peak widths, or peak positions between two samples or between two orientations of the same sample, greater than variations encountered in repeating a data scan.

U.S. Army, Frankford Arsenal
Attn: Miss C. Young
October 7, 1971
Page Two

To investigate any variation of intensity with sample orientation of a pole-figure device was employed. Two differing Bragg reflections of the PZT crystals were investigated. No significant variations in intensity were observed.

Since diffraction line widths are indicative of internal strains, several diffraction lines were carefully scanned to detect any variations. Two orientations of the PZT crystals, and both high and low polarization of the lead metaniobate crystals were examined for several reflections. No variations were observed in line width (or line position) which exceeded normal statistical variations.

It thus appears there are no useful parameters observable by these x-ray techniques which would serve as indicators of sample polarization.

Respectfully submitted,

C. E. Wagner/
Project Director

CEW:brj